

On a New Species of *Maurolicus*, *M. japonicus*.

By

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With Plates XII and XIII.

Dorsal 10 or 11; Anal 8+16; Ventral 7; Lateral Line 23; Transverse line 7.

The length of the head slightly more than the height of the body and a little less than a quarter of the total length (without the caudal). The length of the snout about one-third of the height of the body, and exceeds that of the interorbital. The eye oval, its vertical diameter a little less than its horizontal diameter which is about one-tenth of the length of the body. The breadth of the iris nearly equal all around; the interorbital space about two-thirds the longitudinal diameter of the eye. The cleft of the mouth nearly vertical, the upper jaw crescent-shaped, its posterior half is thinner and broader than its anterior, and reaches to the middle of the eye. Teeth on premaxillary and dentary; small, pointed and in about three rows. Those of the lower jaw perhaps slightly larger than those of the upper. No palatine and vomerine teeth. The nostrils just between the eye and the end of the snout.

The actual measurements of 12 specimens of *Maurolicus japonicus* from Uodai:

Number of Specimens	Total length (without caudal)	Height.	Length of Head.	Snout.	Interorbital space.	Diameter of Eye.
No. 1.	51 mm.	12.0 mm.	13.0 mm.	4.0 mm.	3.0 mm.	5.5 mm.
No. 2.	50 "	10.0 "	13.0 "	4.0 "	3.0 "	5.0 "
No. 3.	48 "	11.0 "	12.0 "	4.0 "	3.0 "	5.0 "
No. 4.	47 "	11.0 "	12.0 "	3.0 "	3.0 "	5.0 "
No. 5.	47 "	11.0 "	10.0 "	3.5 "	2.8 "	5.0 "
No. 6.	47 "	10.5 "	10.5 "	3.5 "	2.8 "	5.0 "

Number of Specimens	Total length (without caudal) 46 mm.	Height. 12.0 mm.	Length of Head. 12.0 mm.	Snout. 4.0 mm.	Interorbital space. 3.0 mm.	Diameter of Eye. 5.5 mm.
No. 7.						
No. 8.	46 "	10.0 "	10.0 "	3.5 "	2.2 "	4.7 "
No. 9.	46 "	11.0 "	10.0 "	3.2 "	2.2 "	4.8 "
No. 10.	44 "	11.0 "	11.0 "	3.0 "	2.7 "	5.0 "
No. 11.	44 "	10.0 "	11.0 "	3.0 "	2.8 "	4.5 "
No. 12.	43 "	11.0 "	9.3 "	3.0 "	2.3 "	4.5 "
Total	559 mm.	130.5 mm.	133.8 mm.	41.7 mm.	32.8 mm.	59.5 mm.
Average of 12 specimens	46.6 mm.	10.9 mm.	11.2 mm.	3.5 mm.	2.9 mm.	5.0 mm.

The measurements of the above specimens of *Maurolicus japonicus* from Uodu in percentage of the total length (without the caudal) :

No. of Specimens.	Total length (without caudal) 100 mm.	Height. 29.5 mm.	Length of Head. 25.5 mm.	Snout. 7.8 mm.	Interorbital space. 5.9 mm.	Diameter of Eye 10.8 mm.
No. 1.						
No. 2.	100 "	20.0 "	26.0 "	8.0 "	6.0 "	10.0 "
No. 3.	100 "	22.9 "	25.0 "	8.3 "	6.3 "	10.4 "
No. 4.	100 "	23.4 "	25.5 "	6.4 "	6.4 "	10.6 "
No. 5.	100 "	23.4 "	21.3 "	7.4 "	6.0 "	10.6 "
No. 6.	100 "	22.3 "	22.3 "	7.4 "	6.0 "	10.6 "
No. 7.	100 "	26.1 "	26.1 "	8.7 "	6.5 "	11.9 "
No. 8.	100 "	21.7 "	21.7 "	7.6 "	4.8 "	10.2 "
No. 9.	100 "	23.9 "	21.7 "	7.0 "	4.8 "	10.4 "
No. 10.	100 "	25.0 "	25.0 "	6.8 "	6.1 "	11.4 "
No. 11.	100 "	22.7 "	25.0 "	6.8 "	6.4 "	10.2 "
No. 12.	100 "	25.6 "	21.6 "	7.0 "	5.3 "	10.5 "
Average measurements in % of the total length	100 "	23.9 "	23.9 "	7.1 "	5.9 "	10.6 "

The origin of the pectoral fin lies in front of the vertical from the posterior end of the gill-opening, and reaches to about two-thirds the distance between the origins of the pectoral and the ventral. The origin of the dorsal fin, a little behind the base of the ventral, is considerably nearer the root of the tail than to the extremity of the snout; the tip of the ventral fin just reaches the anal, if laid backwards. The origin of the anal in the vertical line below the root of the penultimate ray of the dorsal; the base of the fin nearly twice as long as that of the first dorsal, with its anterior third about double the height of the posterior. The base of the second dorsal nearly as long as that of the first, its origin lies in the

vertical from the middle portion of the anal and ends a little behind the vertical from the root of the last anal ray. The caudal fin moderately forked. The anus lies just in front of the anal fin.

Twelve pairs of luminous organs along the belly from the posterior end of the operenum to the base of the ventral (the thoracico-abdominale), the first pair placed nearer together than the rest; the following pairs nearly of the same size, and arranged in parallel rows; nine in the upper series between the pectorals and the ventrals (the laterale), this series not continued backwards; six pairs between the base of the ventrals and the origin of the anal (the circumventrale), the first two pairs of this series placed along the dorsal base of the ventrals, the third, the fourth, the fifth, and the sixth situated in a curved line beginning with the second and ending with the sixth which is placed at the posterior side of the vent, the concavity of the curve facing ventrally; about sixteen pairs along the base of the anal (the anale), the first pair placed above the others; eight or nine pairs between the anal and the caudal (the pre-caudale), and in the same line with the preceding pairs, the last two placed nearer together; six pairs along the gill-opening (the operculare) in front of the pectoral fin to the isthmus, the first pair smaller than the others and placed close together; five on the branchiostegal membrane (the branchiostegale); one before (the anti-orbitale), and two below (the suborbitale) the eye; one at the posterior end of the opercle (the post-operculare); a small pair near the symphysis of the lower jaw.

The numbers of the luminous organs in the thoracico-abdominale, the anale and the precaudale are not constant. Of the thirty-four specimens examined, two possess thirteen pairs of the thoracico-abdominale, one with eleven on the left and twelve on the right; the number differs more with the anale with reference to which among the same thirty-four specimens seventeen pairs are found in nine specimens, in four specimens sixteen on the left and seventeen on the right, two specimens with fifteen on the left and sixteen on the right, one with eighteen pairs, one with eighteen on the left and seventeen on the right, one with eighteen on the left and sixteen on the right, while one with sixteen on the left and fifteen on the right. Lastly, of the precaudale, out of thirty-four speci-

mens examined sixteen specimens with eight pairs, fourteen with nine pairs, one with seven pairs, one with eight on the left and nine on the right, and one with nine on the left and ten on the right.

Numbers of the luminous organs of the thoracico-abdominale, the male, and the precandale in the thirty-four specimens of *Maurolicus japonicus* from Uodn:

Specimens.		Thoraci o-abdominale.	Anale.	Precandale.
No.		Left	13 13	1+15 1+15
		Right		8 8
No.	2.	L. R.	13 13	1+15 1+15
No.	3.	L. R.	12 12	1+17 1+17
No.	4.	L. R.	?	1+17 1+16
No.	5.	L. R.	12 12	1+17 1+15
No.	6.	L. R.	12 12	1+16 1+16
No.	7.	L. R.	12 12	1+16 1+16
No.	8.	L. R.	12 12	1+16 1+16
No.	9.	L. R.	12 12	1+16 1+16
No.	10.	L. R.	12 12	1+16 1+16
No.	11.	L. R.	12 12	1+16 1+16
No.	12.	L. R.	12 12	1+16 1+16
No.	13.	L. R.	?	1+16 1+16
No.	14.	L. R.	12 12	1+15 1+16
No.	15.	L. R.	12 12	1+15 1+16
No.	16.	L. R.	12 12	1+15 1+16
No.	17.	L. R.	12 12	1+15 1+16
No.	18.	L. R.	12 12	1+15 1+15
No.	19.	L. R.	12 12	1+15 1+15
No.	20.	L. R.	12 12	1+15 1+15
No.	21.	L. R.	?	1+15 1+15

Specimens.		Thoracico-abdominale.	Anale.	Precaudale.
No. 22.	L. R.	12 12	1+15 1+15	8 9
No. 23.	L. R.	?	1+15 1+15	9 9
No. 21.	L. R.	?	1+15 1+15	9 10
No. 25.	L. R.	12 ?	1+15 ?	9 ?
No. 26.	L. R.	12 12	1+15 1+14	9 9
No. 27.	L. R.	12 12	1+15 1+15	8 8
No. 28.	L. R.	12 12	1+15 1+15	8 8
No. 29.	L. R.	12 12	1+15 1+15	8 8
No. 30.	L. R.	12 12	1+15 1+15	8 8
No. 31.	L. R.	12 12	1+15 1+15	8 8
No. 32.	L. R.	12 12	1+14 1+15	8 8
No. 33.	L. R.	12 12	1+14 1+15?	8 8
No. 34.	L. R.	11 12	1+16 1+16	9 9

As to the addition or reduction of the organs in any of the above-mentioned three groups, the thoracico-abdominale, the anale and the precaudale, we can not form any conclusion whether these are restricted to one special side of the animals or not. To state the fact only we observe that, of the thoracico-abdominale, the only one case (No. 34) of this kind, shows that it is the left side one which is reduced in number. Of the anale, out of nine cases, four (Nos. 14, 15 [Fig. 8], 16 [Fig. 6], and 17 [Fig. 9]) with an additional organ on the right, two (Nos. 32 and 33) with one organ less on the left, i.e. fifteen on the left and sixteen on the right; one (No. 4, Fig. 7.) with an additional organ on the right and two additional ones on the left; one (No. 5) with two additional organs on the left; while the other one (No. 26) with an organ less on the right side. It will thus be seen that with the anale, more cases are found with a greater number of organs on the right (six cases) than on the left (three cases). Lastly, with the precaudale, we have one case (No. 22, Fig. 11.)

with eight on the left and nine on the right, and another case (No. 24) with nine on the left and ten on the right (Fig. 12). As to the position of the supernumerary organ in a row, or the reduction of an organ in a row, i.e. whether an organ is interposed between the others, or is added at the ends, or taken away from the ends or somewhere from the row, there appears to be some general rule. In the anale of No. 17, where sixteen organs are counted on the left and seventeen on the right, we have the first pair regularly placed on both sides, and while there are three succeeding organs on the left, there are four on the right, the fourth of the left in the same line with the fifth of the right. By closer examination it will be seen that the third right is smaller than the others, and appears to be the one interposed between the second and the third right, pushing the fourth slightly backwards (Fig. 9). The same is seen with the precaudale of No. 24 where we find, instead of four anterior organs on the left, five on the right (Fig. 12). The case of the anale of No. 14 where the supernumerary organ is seen on the right side, is rather interesting, since here in place of the third anterior organ on the left, there are two small organs on the right, showing thus the probable division of the third one on the right (Fig. 10). To give a case where the reduction appears to have taken place, we take No. 26 (Fig. 5) with sixteen on the left, and fifteen on the right. Here we see the two pairs of organs at the posterior end in regular rows, and closely set together, and while on the left hand side three more organs are added and these also in close set, on the right there are only two, the posterior of which or the third from the most posterior one, is placed a little in advance of the corresponding one on the left, the fourth comes to be placed in a regular row with the fifth of the left. Thus while the five organs on the left side are arranged in close set, the third and the fourth on the right are separated from each other by a space, which appears to show that the fourth one here present is in reality the fifth, the original fourth being dropped off. Similarly with the anale in Nos. 4 (Fig. 7), 16, 32, and 33 and with the precaudale in No. 22, the supernumerary or reduced organs are either added or taken away from the intermediary ones, and not at or from the end, the only one exception being No. 15 where the supernumerary one of the anale on the right hand side,

is due to the addition at the extreme hind end, the last one of the left being parallel with the penultimate one of the right (Fig. 8).

Scales large, thin, cycloid; twenty-three in the mid-lateral line, seven in the transverse line. Four large scales in the mid-lateral line; these are the second, the tenth, the fourteenth, and the seventeenth scales from the anterior end, and gradually decreasing in size from before backwards. Seven pairs of small scales along the ventral side of the gill opening, the six anterior pairs of which lying above the branchiostegal luminous organs; twelve pairs of scales along the ventral side of the body between the posterior end of the last branchiostegal organs and the ventral fins, also lying above the thoracico-abdominal organs; six pairs in front of the vent, lying above the six circum-ventral organs. Many pairs of scales on each side of the anal fin and in front of the caudal, each placed above the luminous organs of these regions. Nine pairs of scales above the thoracico-abdominal organs; and a pair of isolated organs in front of the ventral series of organs, are placed below a pair of scales which form the continuation of the scales placed above the thoracico-abdominal organs.

Gill-rakers long and numerous, twenty-four on the first branchial arch. Pseudobranchae present, six in number. The blind sac of the stomach rather large, with pyloric appendages well developed, which are nine in number and of variable length; the intestine runs rather straight to the level of the hind end of the blind sac where it makes an s-shaped twisting and runs again straight to the anus (Fig. 13).

The colour of the animal is silvery on side and belly; sepia brown along the dorsal part. Luminous organs on silvery ground with black pigment; photogenic portion milky white. The peritoneum with deep brown pigments.

Habitat: Uodu, Eddyū, Japan Sea; generally caught with a kind of small ground net, the teguri-ami, from the depth of about two to three hundred fathoms, together with other fishes of commercial value. The same fish is also caught in the seas off Idu peninsula on the Pacific side.

General remarks: That this fish is closely allied to the Atlantic species (*Maurolicus poeyi* Walbaum) there is no doubt. It is, however, to be noticed that there are some points of difference between the two

which justify us to consider the present form as a new species. These are the lesser number of the anal fin-rays in our species, than in the Atlantic fish, and consequently the space between the last anal ray and the caudal is longer in the former than in the latter; thus the eight or nine luminous spots of this portion lying all behind the anal fin in our form, whereas in the Atlantic species only the last two or three spots lie in the same space. Slight differences are also to be observed in the size of the eye in relation to that of the length of the head, and also in the number of luminous organs.

JORDAN, TANAKA and SNYDER in their Catalogue of the Fishes of Japan give a single species of *Muraenesox*, and identify it with the Atlantic form, without giving, however, any definition of the form. Without description of their type specimen, it is not justifiable to consider their fish to be identical with ours. It is very improbable, however, that two nearly allied forms are to be found in one and the same place; neither was the *pennanti* form found among many specimens observed by the present author, which were taken from the same localities where the specimens of the authors were also taken, namely in the seas of Uodn and Idu. It is, moreover, improbable that the present form which is one of the most common fishes taken in the bay of Toyama, should have escaped the notice of such an ichthyologist as TANAKA, who personally visited the same place as the present author did, and obtained the specimens. Lastly, in favour of the view of the identity of the present form with that given by the authors, the fact is to be mentioned, that the structure of the luminous organs described by OSHIMA, from the so-called *M. pennanti*, exactly corresponds with that of the present form, even the absence of the reflector in the antorbital organ being alike in both the forms. All these tend to point to the fact, that the *pennanti* of JORDAN, TANAKA and SNYDER is not the same species as the Atlantic one, but is a species distinct from it.

LITERATURE CITED.

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EXPLANATION OF PLATES.

PLATE XII.

Fig. 1. *Maurolicus japonicus*, magnified about 3 diameters.

Fig. 2. The same, ventral view.

Fig. 3. The same, dorsal view.

PLATE XIII.

Figures 4-12 represent the outlines of the luminous organs drawn with Zeiss objective a*, compensation ocular 2.

Fig. 4. The thoraco-abdominal of the specimen No. 3t in which a reduction took place on the left side.

Fig. 5-10. The anale of six individuals; Fig. 5 represents those of No. 26; Fig. 6, of No. 16; Fig. 7, of No. 4; Fig. 8, of No. 15; Fig. 9, of No. 17 and Fig. 10, of No. 11.

Fig. 11-12. The precaudale of two individuals; Fig. 11, those of No. 2, and Fig. 12, of No. 24.

Fig. 13. The stomach, the pyloric appendages, the liver and the intestine magnified about 4 diameters.